REMARKS

I.   INTRODUCTION

Claims 1, 10, 11, 14 and 17 have been amended. Support for the claim amendments may be found on pages 10-12 of the Specification. Claims 1-11 and 13-17 remain pending in the present application. No new matter has been added. In view of the above amendments and the following remarks, it is respectfully submitted that all of the pending claims are allowable.

II.   OBJECTION TO THE SPECIFICATION

The Specification stands objected to for failing to provide proper antecedent basis for the claimed subject matter. (See 12/23/08 Office Action, p. 2.) Specifically, the Examiner asserts that the Specification fails to provide proper antecedent basis for the recitation "computer readable medium for storing a computer program executable to process…" of claim 17. (See id.) The Specification states that "the data processing device 153 has computing means and memory means to perform the steps of the method." (See Specification, p. 14, ll. 21-22.) Those of skill in the art will understand that the term "memory," as used in the specification, denotes computer-readable memory such as the "computer-readable medium" recited in claim 17. Accordingly, the Applicants respectfully submit that this rejection should be withdrawn.

III.   DOUBLE PATENTING

Claims 1, 3-6 and 8-11 stand rejected on the ground of nonstatutory obviousness-type double patenting as unpatentable over claims 1 and 5-12 of U.S. App. No. 11/569,166 (hereinafter "application '166") in view of Flórez-Valencia et al., "3D Graphical Models for Vascular-Stent Pose Simulation") (hereinafter "Florez-Valencia"). (See 12/23/08 Non-Final Office Action, pp. 2-4.) Claims 3-6 and 8-11 stand rejected on the ground of nonstatutory

obviousness-type double patenting as unpatentable over claims 5-12 of application '166. (See id., pp. 4-5.) In view of the Terminal Disclaimer submitted with the present Amendment, it is respectfully submitted that these rejections should be withdrawn.

IV.   CLAIM REJECTIONS – 35 U.S.C. § 112

Claim 17 stands rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement. (See 12/23/08 Office Action, p. 5.) Specifically, the Examiner asserts that the Specification does not describe the limitation "computer readable medium for storing a computer program executable to process," as recited in claim 17, in such as way as to convey to one skilled in the art that the inventor had possession of the claimed invention at the time the application was filed. (See id., p. 5.) The Examiner notes that the Specification discloses "a computer program product having pre-programmed instructions to carry out the method may also be implemented," but asserts that this is insufficient to support the limitation "computer readable medium for storing a computer program executable to process." (See id., p. 5, citing Specification, p. 14, ll. 22-23.) The Applicants note that the paragraph of the Specification cited by the Examiner also states that "the data processing device 153 has computing means and memory means to perform the steps of the method." (See Specification, p. 14, ll. 21-22.) The Applicants respectfully submit that one of skill in the art, at the time the invention was made, would understand that a computer program such as that stored in the computer readable medium recited in claim 17 does not exist in a vacuum, but rather is necessarily embodied in a storage medium, such as a memory, and more specifically such as the memory means described in the Specification. Therefore, the Applicants respectfully submit that the description of "memory means to perform the steps of the method" contained in the Specification provides sufficient support for the recitation "computer readable medium for storing a computer program executable to process" of claim 17, and that this rejection should therefore be withdrawn.

Claims 11 and 14 stand rejected under 35 U.S.C. § 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. (See 12/23/08 Office Action, pp. 5-6.) Specifically, the Examiner asserts that the term "substantially" renders these claims indefinite as it is unclear at what point an object is "substantially" tubular. (See id., pp. 5-6.) The MPEP states that the term "substantially" is permissible claim language where one of ordinary skill in the art would understand its meaning. (See MPEP, § 2173.05(b), citing *Andrew Corp. v. Gabriel Electronics*, 847 F.2d 819, 6 USPQ2d 2010 (Fed. Cir. 1988).) The Applicants respectfully submit that one of ordinary skill in the art would understand the meaning of a "substantially tubular" organ. Further, even if one of ordinary skill in the art would not understand the meaning from the claim language alone, the Applicants note that the Specification provides examples of substantially tubular organs, such as the colon, arteries, or bronchi. (See, e.g., Specification, p. 1, ll. 8-14; p. 2, ll. 13-14; p. 6, ll. 6-8.) Thus, the Applicants respectfully submit that this rejection should be withdrawn.

V.   CLAIM REJECTIONS – 35 U.S.C. § 103(a)

Claims 1-3, 6, 10, 11, 13 and 17 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Florez-Valencia in view of Dumoulin, et al., "Mechanical Behaviour Modelling of Balloon-Expandable Stents" (hereinafter "Dumoulin") in view of Hernandez-Hoyos et al., "Computer-assisted Analysis of Three-Dimensional MR Angiograms" (hereinafter "Hernandez-Hoyos"), in view of Montagnat et al., "A Hybrid Framework for Surface Registration and Deformable Models" (hereinafter "Montagnat"), and further in view of Yim et al., "Vessel Surface Reconstruction With a Tubular Deformable Model" (hereinafter "Yim"). (See 12/23/08 Office Action, pp. 6-12.)

Claim 1, as amended, recites "[a]n image data processing method of automatic adaptation of 3-D surface Model to image features, for Model-based image segmentation, the method comprising: creating a deformable tubular mesh model for fitting a 3-D path based on a centerline of a 3-D tubular object of interest, the 3-D path comprising a set of ordered points

defining a plurality of path segments, the mesh model having an initial radius and comprising a plurality of mesh segments corresponding to the plurality of path segments; and automatically adapting a length of a mesh radius of each mesh segment based on a product of the initial radius and a shrinking factor, the shrinking factor determined based on the initial radius and a radius of local curvature of the corresponding path segment."

Addressing the method step of "automatically adapting a length of a mesh radius," the Examiner cites Yim. (See id., p. 8.) Yim describes a coordinate system that warps radial lines in areas where the vessel axis is curved in order to prevent radial lines from intersecting one another. (See Yim, p. 1414, col. 1, ¶ 2.) Radial lines intersect one another if one radial line enters the territory of another; a radial line's territory is defined as the region that is closer to the origin of that radial line than to the origin of any other radial line. (See id., p. 1414, col. 1, ¶ 3.) Thus, intersections can be prevented by confining each radial line to its own territory. (See id., p. 1414, col. 1, ¶ 3.) Each radial line is thus truncated at the point at which it leaves its own territory. (See id., p. 1415, col., 1, ¶ 1.) However, Yim does not disclose or suggest that the mesh radius is adapted "based on a product of the initial radius and a shrinking factor," or that "the shrinking factor [is] determined based on the initial radius and a radius of local curvature of the corresponding path segment," as recited in claim 1. The other references cited fail to cure this deficiency. Thus, the Applicants respectfully submit that Florez-Valencia, Dumoulin, Hernandez-Hoyos, Montagnat and Yim, alone or in combination, neither disclose nor suggest "automatically adapting a length of a mesh radius of each mesh segment *based on a product of the initial radius and a shrinking factor, the shrinking factor determined based on the initial radius and a radius of local curvature of the corresponding path segment*," as recited in claim 1. Accordingly, this rejection should be withdrawn. Because claims 2, 3, 6, 10, 11 and 13 depend from, and, therefore, include all of the limitations of claim 1, it is respectfully submitted that these claims are also allowable for at least the foregoing reasons.

Claim 17, as amended, recites "[a] computer readable medium for storing a computer program executable to process data for automatic adaptation of a three-dimensional surface model to image features, the computer readable medium comprising: a mesh model code

segment for creating a deformable tubular mesh model for fitting a three-dimensional path based on a centerline of a 3-D tubular object of interest, the three-dimensional path comprising a set of ordered points defining a plurality of path segments, the mesh model having an initial radius and comprising a plurality of mesh segments corresponding to the plurality of path segments; and a radius adapting code segment for automatically adapting a length of a mesh radius of each mesh segment based on a product of the initial radius and a shrinking factor, the shrinking factor determined based on a radius of local curvature of the corresponding path segment and the initial radius."

The Applicants respectfully submit that Florez-Valencia, Dumoulin, Hernandez-Hoyos, Montagnat and Yim neither disclose nor suggest "a radius adapting code segment for automatically adapting a length of a mesh radius of each mesh segment *based on a product of the initial radius and a shrinking factor, the shrinking factor determined based on a radius of local curvature of the corresponding path segment and the initial radius*," as recited in claim 17, for the reasons discussed above with reference to claim 1. Accordingly, this rejection should be withdrawn.

Claims 4, 5, 7-9 and 14-16 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Florez-Valencia, Dumoulin, Hernandez-Hoyos, Montagnat and Yim as applied to claims 1-3, 6, 10, 11, 13 and 17 above, in view of Williams et al., "Rational Discrete Generalized Cylinders and their Application to Shape Recovery in Medical Images" (hereinafter "Williams"). (See 12/23/08 Office Action, pp. 12-15.)

The Applicants respectfully submit that Williams fails to cure the deficiencies of Florez-Valencia, Dumoulin, Hernandez-Hoyos, Montagnat and Yim discussed above with reference to claim 1. Accordingly, the rejections of claims 4, 5 and 7-9, which depend from claim 1, should be withdrawn for at least the foregoing reasons.

Claim 14, as amended, recites "[a] method of automatically adapting a three-dimensional surface model of a tubular object, the method comprising: determining a three-dimensional path corresponding to a centerline of the tubular object; defining a plurality of path segments on the three-dimensional path; creating an initial straight deformable cylindrical mesh model having a

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length equal to a length of the three-dimensional path; dividing the initial mesh model into a plurality of mesh segments corresponding to the plurality path segments; computing a rigid-body transformation for each mesh segment for transforming an initial direction of each mesh segment into a path direction of the corresponding path segment; applying the rigid-body transformation for each mesh segment to corresponding vertices of the mesh segment; and adapting a mesh radius of each mesh segment based on a product of an initial radius of the initial mesh model and a shrinking factor, the shrinking factor being determined based on at least a radius of curvature and a length of the corresponding path segment."

The Applicants respectfully submit that Florez-Valencia, Dumoulin, Hernandez-Hoyos, Montagnat, Yim and Williams neither disclose nor suggest "adapting a mesh radius of each mesh segment *based on a product of an initial radius of the initial mesh model and a shrinking factor, the shrinking factor being determined based on at least a radius of curvature and a length of the corresponding path segment*," as recited in claim 14, for the reasons discussed above with reference to claim 1. Accordingly, this rejection should be withdrawn. Because claims 15 and 16 depend from, and, therefore, include all of the limitations of claim 14, it is respectfully submitted that these claims are also allowable for at least the foregoing reasons.

CONCLUSION

It is therefore respectfully submitted that all of the presently pending claims are allowable. All issues raised by the Examiner having been addressed, an early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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